Higher Education:
Driving the Innovation Economy

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Commission on the Future of Higher Education
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Driving the innovation economy

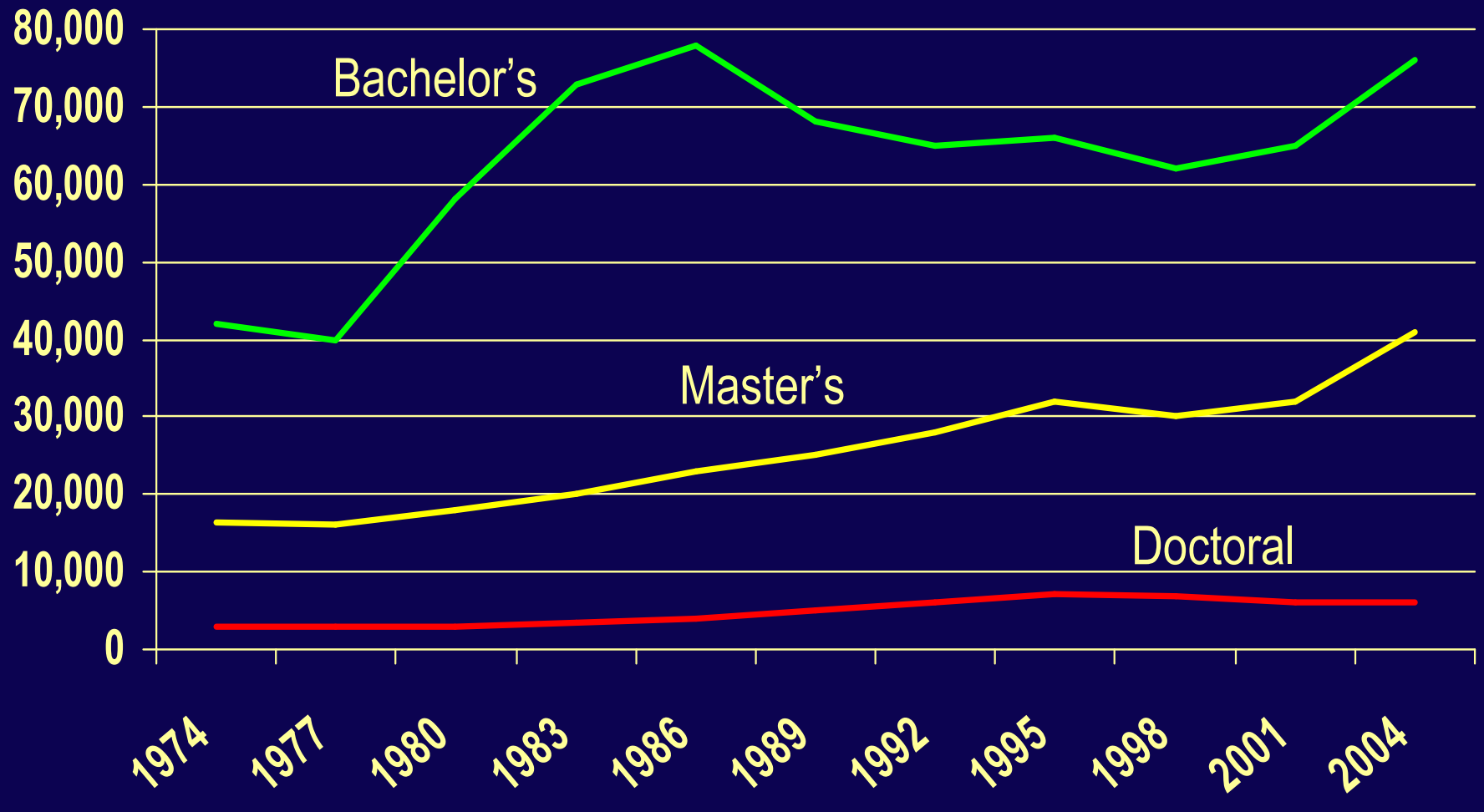
- Trends in higher education
- The changing global environment
- The role of the university in the innovation economy
- The changing shape of the university

Trends in higher education

- Enrollments in science and engineering programs are not keeping pace.
- University science and engineering faculty are aging.
- R&D investments in science and engineering shift from federal (frontier) to industry (applied).
- Funding model for public higher education is changing.

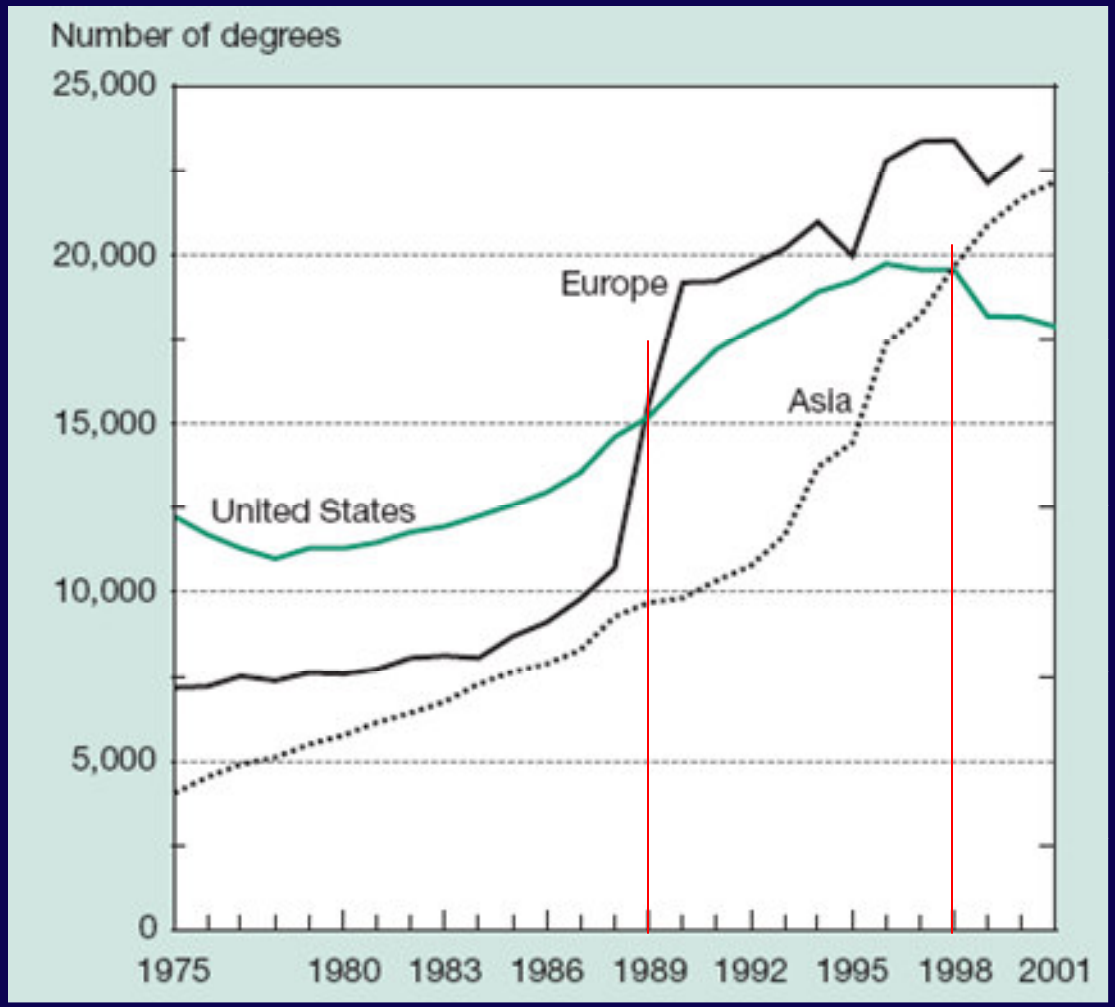
U.S. engineering degrees

1974-2004



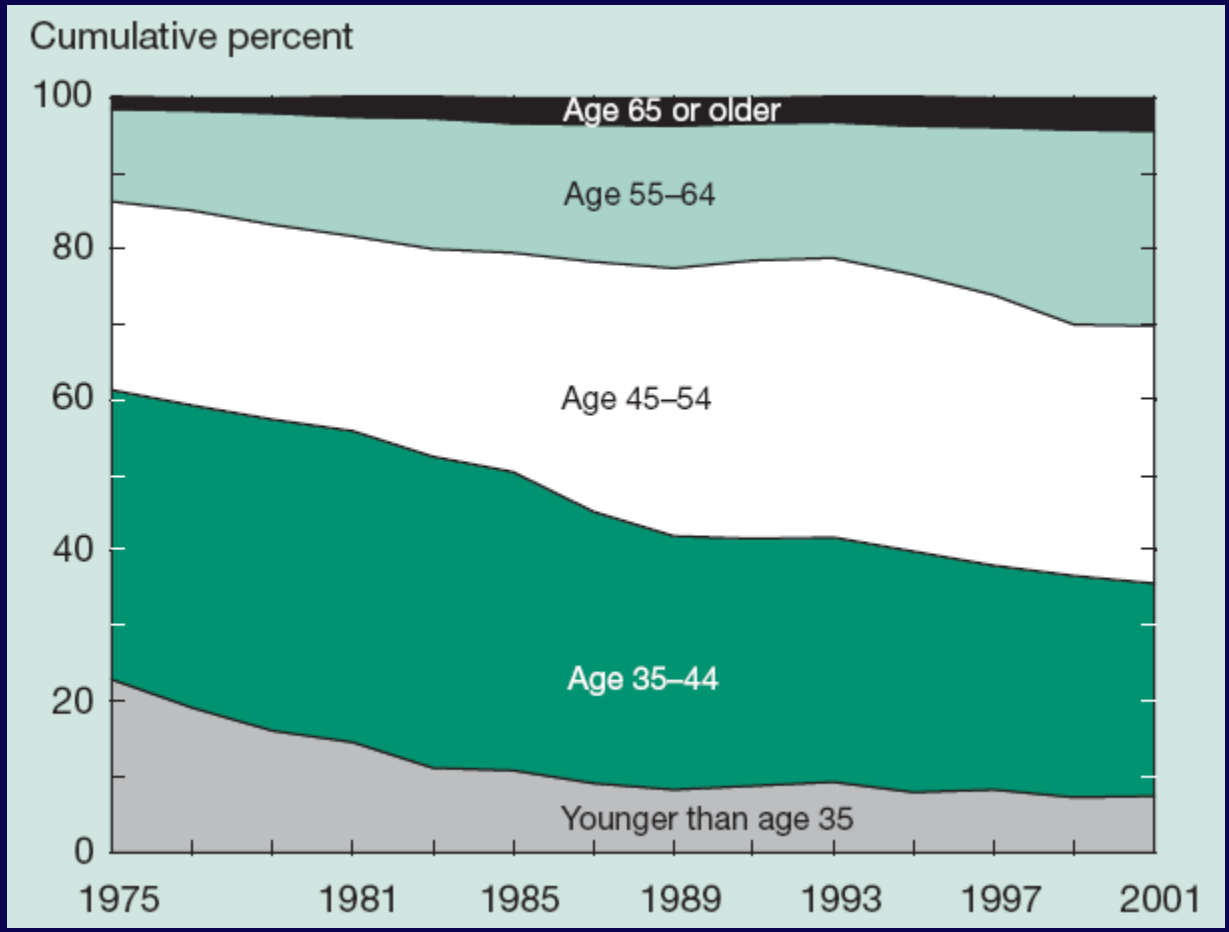
American Association of Engineering Societies 2004

U.S. outstripped in doctoral degrees in natural sciences and engineering



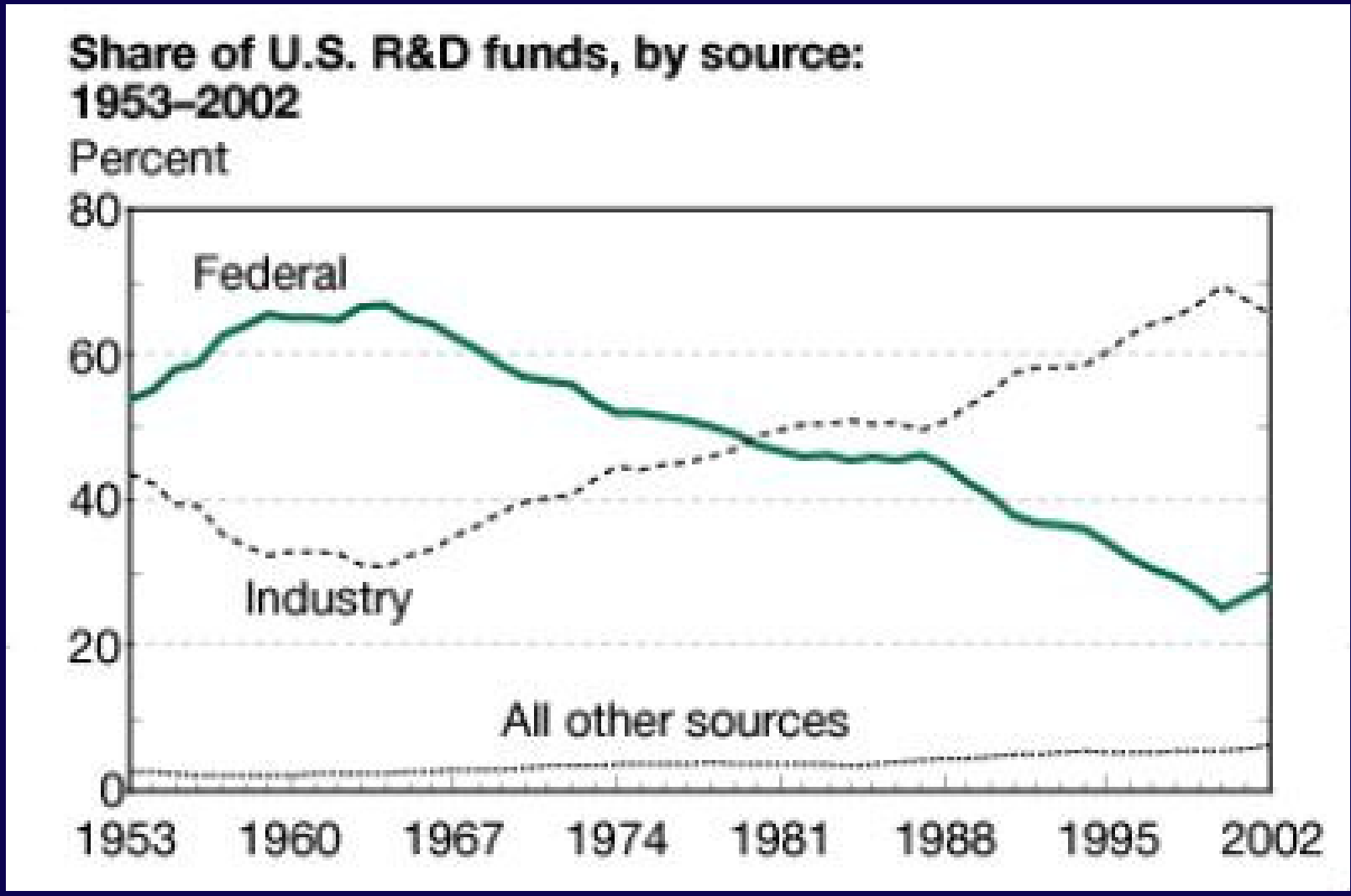
NSF Science & Engineering Indicators 2004

University faculty with doctoral degrees in science and engineering



NSF Science & Engineering Indicators 2004

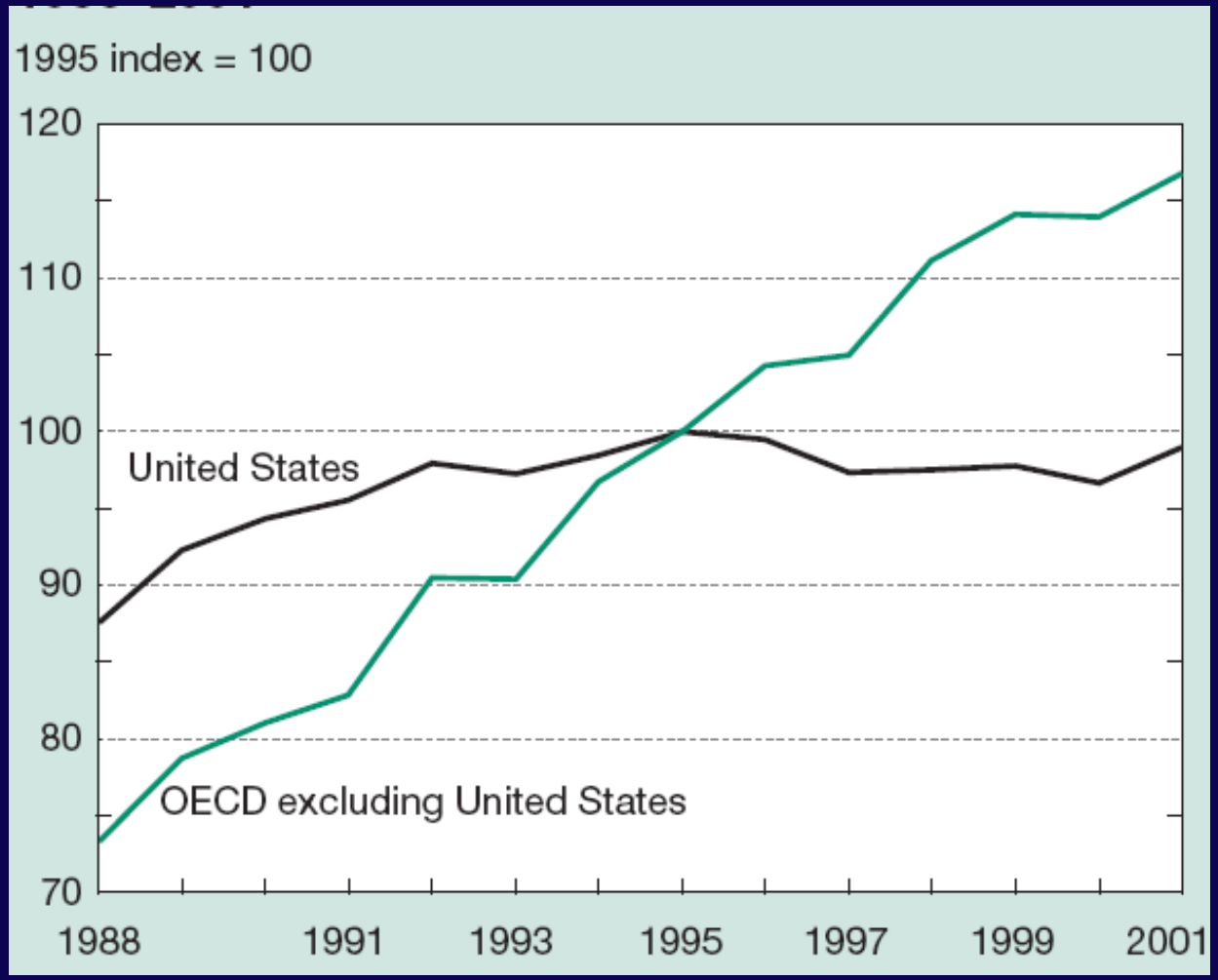
Research balance shifts



NSF Science & Engineering Indicators 2004

Output of science and engineering articles

Other nations in the Organization for Economic Cooperation and Development are outpacing the United States.



NSF Science & Engineering Indicators 2004

Funding patterns are changing

- Higher education loses out in the state funding competition with K-12 education, health care, prisons.
- Public universities seek more autonomy in exchange for reduced funding.
- Rising tuition, limited state/federal need-based assistance reduces accessibility.
- Competition for outstanding faculty in critical fields drives up costs for research universities.

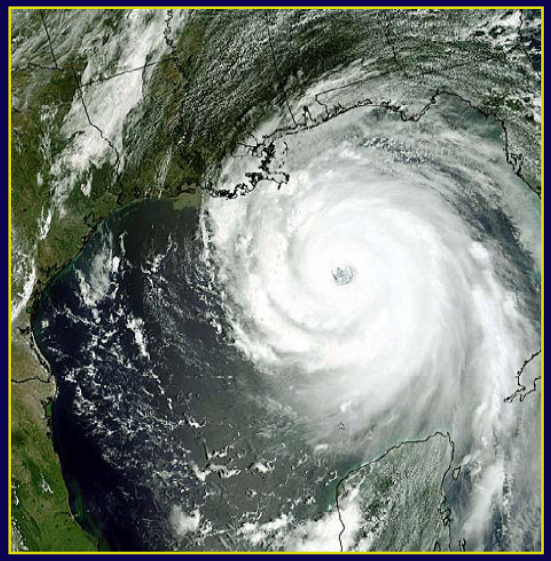
"To an extraordinary degree, our nation's fate depends on maintaining our world leadership in science and technology. Our superpower status is tied to it… Yet young people in the Western industrialized nations, especially in the United States, are not flocking to study science and technology like their counterparts in other countries."

Daniel Yankelovich, founder and CEO
Viewpoint Learning, Inc.
Public Agenda
DYG, Inc.

Societal forces

- Growing population
- Fresh water shortages
- Terrorism; wars in Iraq, Afghanistan
- New diseases
- Global warming, environmental problems
- Coastal development

Global warming + coastal development



Hurricane Katrina
August 29, 2005

Levees and flood walls were breached and over-topped.

Economic forces

- Internet/high-speed communications
- Markets have opened up
- Emergence of technology-based economies in other nations
- Sustained investment in higher education in countries like China and India

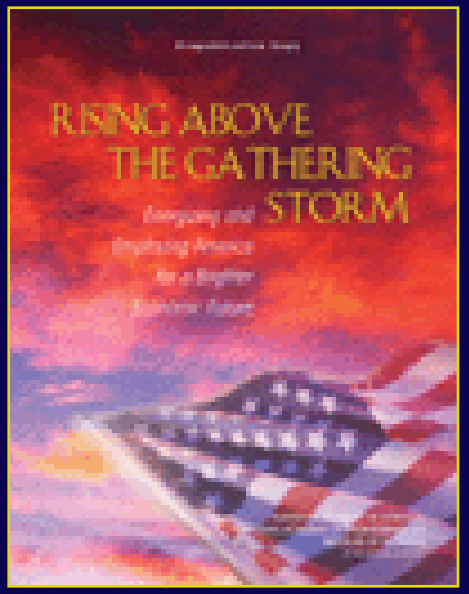
Engineer 2020

The competition grows fiercer

- By 2010, 90 percent of the world's scientists and engineers will live in Asia.
- The US has increased nanotechnology research funding to $1 billion a year, but Western Europe and Japan have kept pace, and other nations are also making significant investments.
- 6 of the world's 25 most competitive IT companies are headquartered in the US; 14 are headquartered in Asia.

The United States must learn to compete in a world in which…

- The largest technological workforces reside in other nations.
- We generate only one of four or five major inventions.
- Our wages and health care costs are higher than our global competitors.
- The domestic market we offer is very small in size compared to Asia.



"The scientific and technical building blocks of our economic leadership are eroding at a time when other nations are gathering strength…

We fear the abruptness with which a lead in science and technology can be lost – and the difficulty of recovering a lead once lost, if indeed it can be regained at all."

Rising Above the Gathering Storm
The National Academies

"Innovation fosters new ideas, technologies, and processes that lead to better jobs, higher wages, and a higher standard of living. For advanced industrial nations no longer able to compete on cost, the capacity to innovate is the most critical element in sustaining competitiveness."

InnovateAmerica
National Innovation Initiative report

Innovation is critical to meeting the nation's goals:

- National security
- Economic prosperity
- Environmental sustainability
- Treating and preventing illness and disease

Challenges and opportunities

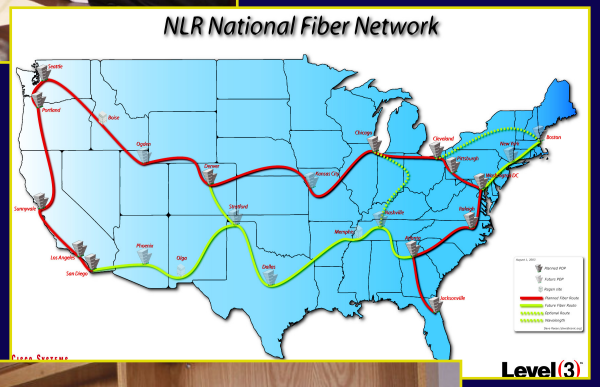
- The bar for innovation is rising
  - Multi-disciplinary and complex
  - Diffusing at an increasingly rapid pace
  - Collaborative between creators and users
  - Global in scope
- Appropriate balances are more critical
  - Between competition and collaboration
  - Between security and openness
  - Between nationalism and globality
  - Between analysis and ambiguity

Universities and innovation: 101

- Educate the workforce of the future
- Conduct frontier research that provides discoveries and knowledge
- Promote technology transfer

Universities and innovation: 201

- Interdisciplinary collaboration
- IT networks
- Policy expertise
- Openness and diversity
- Research infrastructure sites
- Nexus for ideas



Universities and innovation: 301

- Innovation-based experiential learning
- Going global
- IT-enhanced learning
- Interdisciplinary teaching and learning
- Accelerated commercialization of new technology

Engineer 2020

Educating a new breed of engineer

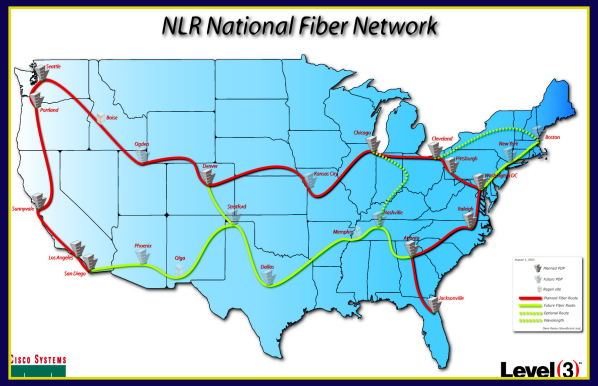
- Strong analytical skills
- Practical ingenuity, creativity; an innovator
- Understanding of the larger social context of technology
- Global perspective
- High ethical standards, professionalism
- Dynamic, agile, resilient, flexible
- Lifelong learner
- Adaptive leader

New opportunities for undergrads

- Undergraduate research
- International experience
- Communication skills
- Teamwork
- Leadership
- Recognition of new learning styles

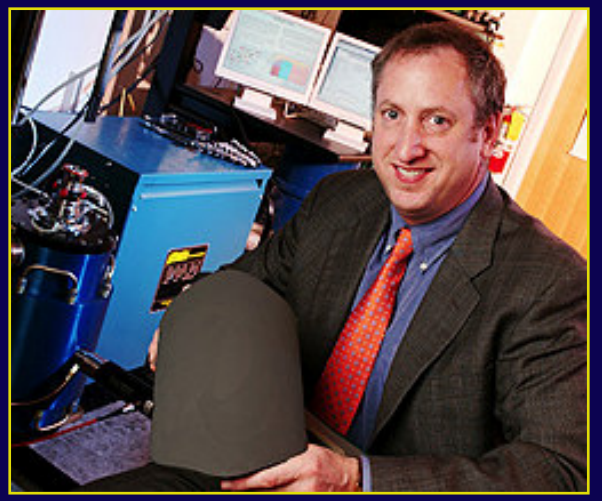
New IT applications

- Web enhanced classes
- Information commons
- Interactive online classes
- Distance learning
- National LambaRail



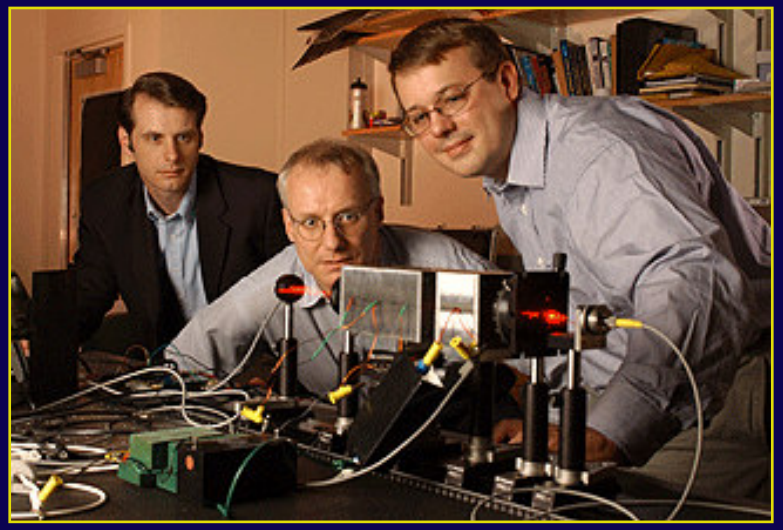
Commercializing discoveries

- Bayh-Dole Act
- Clear path to commercialization from research labs
- Incubators, enterprise parks



Taking technology from lab to market

Georgia Tech's VentureLab



UC San Diego's von Liebig Center for Entre-preneurism and Technology Advancement

Going global

- Competition, but also collaboration with others around the world
- Research partnerships
- Dual degree agreements
- Interactive/real time distance learning

Promoting global education

- Clearing the way for international students to study in the United States (visa, H1-B issues)
- Increasing American students studying abroad
- Addressing the "deemed exports" issue

"We must work aggressively to find new and effective ways to market the depth and diversity of American education overseas and to engage more of our schools in the international arena."

Undersecretary of State Karen Hughes

U.S. University Presidents Summit on International Education

Co-hosts: Sec of State Condoleezza Rice, Sec of Education Margaret Spellings

"The emerging global university is set to be one of the transformative institutions of the current era."

"The brains business"
The Economist, September 2005